

Name: _____

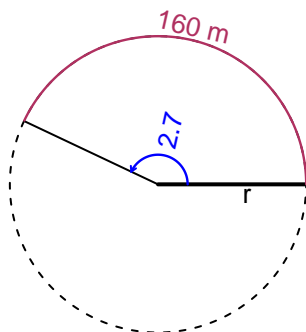
Date: _____

Trig Final (Solution v19)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.7 radians. The arc length is 160 meters. How long is the radius in meters?

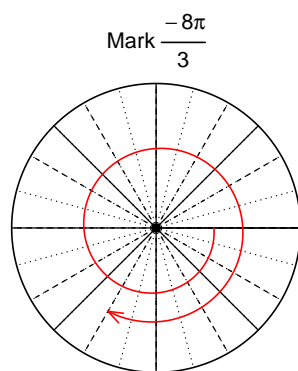


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 59.26$ meters.

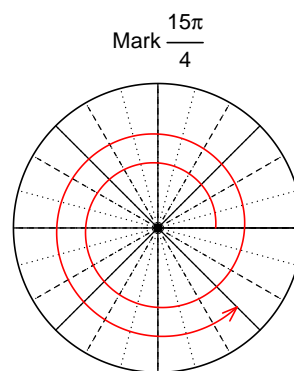
Question 2

Consider angles $-\frac{8\pi}{3}$ and $\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{8\pi}{3}\right)$ and $\cos\left(\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-8\pi/3)$

$$\sin(-8\pi/3) = -\frac{\sqrt{3}}{2}$$



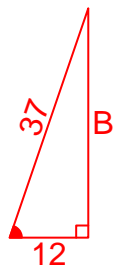
Find $\cos(15\pi/4)$

$$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$$

Question 3

If $\cos(\theta) = \frac{-12}{37}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

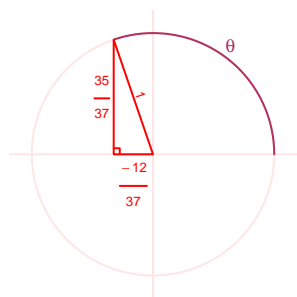
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}12^2 + B^2 &= 37^2 \\ B &= \sqrt{37^2 - 12^2} \\ B &= 35\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{35}{37}}{\frac{-12}{37}} = \frac{-35}{12}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 2.02$ meters, an amplitude of 4.65 meters, and a frequency of 6.15 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.65 \sin(2\pi 6.15t) + 2.02$$

or

$$y = -4.65 \sin(12.3\pi t) + 2.02$$

or

$$y = -4.65 \sin(38.64t) + 2.02$$